

522 CMR 16.00: CONTROLS AND SAFETY DEVICES FOR AUTOMATICALLY **FIRE**
BOILERS (ASME SAFETY CODE, NO. CSD-I, PART CW **STEAM** AND
WATERSIDE CONTROLS, 1977) UNITS OVER 200,000 BTU'S

Section

16.01: Automatic Low Water Fuel Cutoff **and/or** Combined Water Feeding Device

16.02: Flow Sensing Controls

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16.04: Temperature Controls

16.05: Safety and Safety Relief Valves

16.01: Automatic Low Water Fuel Cutoff and/or Combined Water Feeding Device

(1) General Requirements for Water Level Controls for all Boilers.

- (a) Each low **water** fuel cutoff or combined feeder cutoff device shall conform to AND B136.1 and shall be accepted by a nationally recognized testing organization.
- (b) Installation diagrams and instructions shall be furnished by the manufacturer.
- (c) Low water fuel cutoff or combined feeder cutoff devices shall be **located** to provide safe access for cleaning, repairing, testing and inspection.
- (d) The low water fuel cutoffs shall have a pressure rating at least equal to the set pressure of the safety valve or safety relief valve.
- (e) In probe type low water cutoffs, an open circuit failure, break or disconnection of the electrical components or conductors in the safety circuit shall prevent continued operation of the firing mechanism.
- (f) Alarms, when used, shall be distinctly audible above the ambient noise level, and may be used in conjunction with signal lights. They shall be located to alert the operator or an individual who has been **instructed** in what action to take when the **alarm** indicates that a potentially dangerous situation is developing.

(2) Requirements for Low Pressure Steam or Vapor System Boilers.

- (a) Each automatically fired low pressure steam or vapor system boiler shall have a least one automatic low water fuel cutoff or combined feeder cutoff device. Boilers with a pumped condensate return shall have two such cutoff devices, each attached to separate connections. Each cutoff device shall be installed to prevent start-up and to cutoff the boiler fuel supply **automatically** when the surface of the water falls to a level not lower than the lowest visible part of the gauge glass. A water feeding device when used, shall be constructed and installed so that the water inlet valve cannot feed water into the boiler through the float chamber or its connections to the boiler. The water feeding device shall be located to supply requisite feedwater.
- (b) When dual low water **cutoff** controls are used, the electrical circuit shall be connected in such a manner that either control will shut off the **fuel** supply to the boiler when a low water condition develops. One control shall be set to function ahead of the other. Functioning of the lower of the two controls shall cause safety shutdown (lockout) requiring manual reset. The manual reset may be incorporated in the lower cutoff control, or may be effected remotely. Where a reset device is separate or remote **from** the low water cutoff a means shall be provided to indicate that the low water cutoff had operated. The manual reset device may be the instantaneous type, or may include a time delay of not more than three minutes after the fuel has been cutoff.
- (c) The cutoff device may be inserted internally or attached externally to a boiler. **An** external cutoff device may be connected to water column piping which shall be not less than one inch (26 mm) pipe size. When the cutoff device is connected to the boiler by pipe and fittings, no shutoff valves of any type shall be placed in the connecting piping and a cross or equivalent fitting shall be placed in the water piping connection at every right angle to facilitate cleaning and inspection. A full size drain valve and piping shall be placed on the bottom of the lowest cross.

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(d) A low water fuel cutoff or combined feeder cutoff device may also be installed in the tapped openings available for attaching a water gauge glass direct to a boiler, provided the connections are made to the boiler with nonferrous tees or Y's not less than $\frac{1}{2}$ inch (13 mm) pipe size between the boiler and the water gauge glass so that the water gauge glass is attached directly and as close as possible to the boiler; the run of tee or Y shall take the water glass fitting, and side outlet or branch of the tee or Y shall take the fuel cutoff water feeding device. The ends of the all nipples ~~shall be~~ reamed to full size diameter.

(e) Fuel cutoff or combined feeder cutoff devices embodying a separate chamber shall have a vertical drain pipe and a **blowoff** valve, not less than $\frac{1}{4}$ inch (19mm) pipe size, located at the lowest point of the chamber or water equalizing pipe connections so that the chamber and the equalizing pipe can be flushed and the device tested.

(f) A system may incorporate a time delay component with the low water fuel cutoff device to prevent short cycling. This component shall not constrict any connecting, piping, and the time delay shall not exceed the boiler manufacturer's recommended timing or 90 seconds, whichever is less. The device shall cut off the fuel supply when the water falls to the lowest visible part of the gauge glass.

(3) Requirements for Hot Water Heating Boilers.

(a) Each **automatically** fired hot water heating boiler except those installed in residences (as defined by the authority having jurisdiction) shall be protected by a low water fuel cutoff or combined feeder cutoff device suitable for hot water service (See also **CW-200**).

(b) Since there is no **normal** waterline to be maintained in a hot water boiler, the low water fuel cutoff can be located any place above the lowest safe permissible water level established by the boiler manufacturer.

(c) If the low water fuel cutoff or combined feeder cutoff is located in the system piping, it must be assured that the float chamber will drain properly under a low water condition; and the installation must be arranged to assure that if flow occurs in the float chamber, it will be in the upward direction.

(d) Functioning at the low water fuel cutoff or combined feeder cutoff due to a low water condition shall cause a safety shutdown (lockout) requiring manual reset. Where a reset device is separate or remote **from** the low water cutoff a means shall be provided to indicate that the low water cutoff had operated. The manual reset device may be the instantaneous type or may include a time delay.

(e) A means shall be provided for testing the operation of the device without resorting to draining the entire system. Such means shall not render the device unsafe or inoperable.

(f) The means for testing flow ~~type~~ cut off shall be by closing off the water supply, top and bottom, by means of a lever activated valve that is tied together and being able to be locked in the open position.

(4) Requirements for High Pressure Steam Boilers.

(a) Each automatically fired high pressure steam boiler, except miniature boilers, **shall** have at least two automatic low water fuel cutoff devices. Each cutoff device shall be installed to prevent startup and to cut off the boiler fuel supply automatically when the surface of the water falls to a level not lower than the lowest visible part of the gauge glass. One control shall be set to **function** ahead of the other. Each miniature boiler shall have at least one low water fuel cutoff device.

(b) Functioning of the lower of the two controls shall cause a safety shutdown (lockout) requiring manual reset. The manual reset may be incorporated in the lower cutoff control, or may be effected remotely. Where a reset device is separate or remote from the low water cutoff a means shall be provided to indicate that the low water cutoff had operated. The manual reset device may be of the instantaneous type, or may include a time delay of not more than three minutes after the fuel **has** been cut **off**.

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(c) ~~The~~ fuel cutoff device may be inserted internally attached **externally** to the boiler. An external cutoff device may be attached on piping connections shall be a least one inch (26 mm) pipe size. ~~If~~ the low water fuel cutoff is connected to the boiler by pipe or fittings, no **shutoff** valves of any ~~type~~ shall be placed in such piping. A cross or equivalent fitting shall be placed in the water piping connection at every right angle to facilitate cleaning and inspection. Fuel cutoff devices embodying a separate chamber shall have a vertical drain pipe and a **blowoff** valve, not less than 1/4 inch (6.4 ~~mm~~) pipe size, located at the lowest point of the chamber or water equalizing pipe connections so that the chamber and the equalizing pipe can be flushed and the device tested.

(d) A system may incorporate a time delay component with the low water fuel cutoff device to prevent short cycling. ~~This~~ component shall not constrict any connecting piping, and the time delay shall not exceed the boiler manufacturer's recommended timing or 90 seconds, whichever is less. The device shall cut off the fuel **supply** when the water falls to the lowest visible **part** of the gauge glass.

16.02: Flow Sensing Controls

Requirements for Flow Sensing Devices for Forced Circulation Boilers

(1) In lieu of the requirements for low water cutoffs in 522 CMR 16.01, a water tube or coil **type** boiler **requiring** forced circulation to prevent overheating and failure of the tubes or coils ~~shall have an accepted device to prevent burner operation when the circulating flow is below a safe minimum.~~

(2) ~~When~~ there is a definitive waterline, a low water fuel cutoff as required in 522 CMR 16.01 ~~shall be~~ provided in addition to the sensing device required in 522 CMR 16.02(1).

(3) A flow sensing device shall be located to ensure that the sensing device shall not be **activated** if a relief condition occurs.

16.03: Pressure Controls

Requirements for Pressure Controls for Steam Boilers

(1) Each boiler **control** shall conform to AND B136.1, and shall be accepted by a nationally recognized testing organization.

(2) Each automatically fired steam boiler or system of commonly connected steam boilers shall have at least one steam pressure control device which will shut off the fuel supply to each boiler or system of commonly connected boilers, when the steam pressure reaches a preset maximum operating pressure. This requirement does not preclude the use of additional operating control devices where required. Each limit and operating control shall have its own sensing element and operating switch. Provisions of 522 CMR 2.03(7) apply.

(3) In addition to the pressure control required in **CW-399(b)** each individual automatically fired steam boiler shall have a high steam pressure limit control that will prevent generation of steam pressure in excess of the maximum allowable pressure. Functioning of this control shall cause a safety shutdown (lockout) requiring manual reset. The manual reset may be incorporated in the pressure limit control, or may be effected remotely. Where the reset device is separate or remote from the pressure limit control a means shall be provided to indicate that the pressure limit control had operated.

(4) No shutoff valve of any type shall be placed in the steam pressure connection between the boiler and the high pressure limit control device.

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(5) Each pressure control device shall be protected with a syphon, or equivalent means of maintaining a water seal, that will prevent steam **from** entering the control. The minimum size of a syphon shall be $\frac{1}{4}$ inch (6.4 mm) standard pipe size. Ferrous and nonferrous tubing with an inside diameter at least equal to standard pipe sizes may be substituted for pipe. When a control incorporating a mercury switch is mounted on the syphon, the loop of the syphon shall be in a plane that is 90° (1.57 rad) from the plane of the mercury switch.

(6) Supply connections shall not be less than one fourth inch (6.4 mm) standard pipe size if the pipe is constructed of nonferrous material. Ferrous connections shall not be less than $\frac{1}{2}$ inch (13mm) pipe size. If the pipe is over five feet (1.5 m) long, the pipe size shall be one inch (26 mm). Ferrous and nonferrous tubing with an inside diameter at least equal to standard pipe sizes may be substituted for pipe.

(7) When multiple controls are mounted on or fed **from** a manifold, the manifold and common source connection to the boiler shall be at least $\frac{3}{4}$ inch (19 mm) pipe size. Controls must be individually piped from the manifold according to the provisions in 522 CMR 16.03(6).

(8) The upper set point limit of the pressure control selected shall not exceed the maximum allowable working pressure of the boiler.

16.04: Temperature Controls

Requirements for Temperature Controls for Hot Water Heating and Supply Boilers

(1) Each temperature control device shall conform to AND B136.1 and shall be accepted by nationally recognized testing organization.

(2) Each automatically fired hot water boiler, or each system of commonly connected hot water boilers shall have at least one **temperature** actuated control to shut off the **fuel** supply when the system water reaches a preset maximum operating temperature. This requirement does not preclude the use of additional operation control devices where required. Each limit and operating control shall have its own sensory element and operating switch.

(3) In addition to the temperature control required in **CW-400b**, each individual automatically fired hot water boiler shall have a high temperature limit control that will prevent the water temperature **from** exceeding the maximum allowable temperature. Functioning of this control shall cause a shutdown (lockout) requiring manual reset. The **manual** reset may be incorporated in the temperature limit control, or may be effected remotely. Where a reset device is separate or remote from the temperature limit control, a means shall be provided to indicate that the temperature limit control had operated.

16.05: Safety and Safety Relief Valves

Requirements for Steam and Hot Water Heating Boilers The safety and safety relief valves of all steam and hot water heating boilers **shall** conform to the **ASME** Boiler and Pressure Vessel Code, Section I or IV as applicable.

REGULATORY AUTHORITY

522 CMR 16.00: M.G.L. c. 146.